

The Canadian Entomologist

VOL. LIHI.

LONDON, MARCH, 1921.

No. 3

POPULAR AND PRACTICAL ENTOMOLOGY.

THE LIFE-HISTORY OF A HOBBY HORSE.

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PART II.—BOY AND MAN—SAPLING GROWTH.

(Continued from page 28, Vol. LIHI.)

Long before Slyboots went abroad, a new element had begun to enter into our lives which made itself specially felt in our dealings with Nature—the joy of memory and past associations. This seemed to grow quite independently of the rapid waning of novelty from our environment and out of all proportion. I can remember how my brother and I both lamented that while going back to Scotland seemed to give us unspeakable thrills of pleasure, no such inspiration came from trips in England. It puzzled us both at the time, but I have no doubt now that it was due to the countless happy memories awakened in us by the sights and sounds of childhood's home; just as soon as we crossed the Tweed at Carlisle, and heard the names of the stations shouted in good broad Doric. My brother never stayed in England long enough for these stored-up treasures of the senses to be converted into memories, but I am happy to think and to bear testimony to what I suppose is a universal human experience, that I can call these sweets of life to-day not only from our native heath of Scotland, but from many an English lane, aye! and from half a hundred sunny scenes of old Ontario.

This fondness for revelling in memory, it seems to me, grew very fast after Slyboots went abroad, till it became a passion for the old familiar things. It was then almost certainly for that reason that the charm of recurring seasons first laid hold upon me and a hungry craving for the Spring. It had always been living things that drew me, or things that once had lived (like fossils of the chalk) and now bore mute witness through the ages to the far-off day of their pride; and I came to yearn for signs of life's renewal on the earth. Autumn and winter were the dead seasons, but how eagerly I watched for the rathe primrose and the springing violet! with what exultation I caught the earliest call of the cuckoo and the first skimming flight of the migrant swallow! The coming of Spring made the heart gush as though it too had been for months fast held in winter's icy clasp.

I was much given to long, solitary walks. To wander land and meadow, woodland and moor, mountain and glen, was an exquisite pleasure that thrilled the very soul; all day long, no doubt, on these tramps, I was drinking in countless sights and sounds, landscape mellowed in the distance, soft hues of foliage, a hundred flowers and ferns and birds, the murmur of pines and running water, the cooing of the stock-dove and the song of the Skylark; but I was rarely con-

scious, except in the first days of early Spring, of the individual notes of colour and music and fragrance that blended in these hours of happy reverie.

Wherever I went, seemingly, I must first make myself acquainted with any new feature of living Nature that came within my ken, be it insect, bird, or flower, before I could give myself over to the contemplation and enjoyment of earth. But once the new had become the familiar, I was satisfied, and fell back on the old pleasures of memory and association. Thus the first two years of my residence at Oxford kept me busy with the surface fossils of the stone-brash; repeated visits must be made to Iffley to see the wonderful fritillaries in bloom, trips taken up the Cherwell at the season of the cowslip, and whole days spent haunting the edge of Wytham Wood for the enthralling song of the nightingale; the same with first days in Buckingham and Worcestershire, in Somerset and Devon. New discoveries brought keen pleasure and delight, but these were as nothing to the ecstasy of revisiting; when the novelties had been caught up in a network of associations, and their beauty enhanced a thousandfold by the host of memories they awakened, all bathed in a subtle atmosphere of emotion. And perhaps of greater value still for the mind in its maturing, were the hours of conscious meditation and reflection on Nature and life, for which all this raw material of observation was, I must believe, an instinctive preparation.

There comes to most of us in the exuberance of youth, a day when we are impatient of all tradition, and even feel guilty of a certain dishonesty in the placid acceptance of current opinion. I was about sixteen when the eternal riddle of existence first propounded itself to me, and none of the conventional readings brought satisfaction or peace of mind. This was a year after my brother went abroad, the first summer holidays spent in Scotland without his companionship. Our host was always the same, an old army doctor whose acquaintance we had first made shortly before my father's death. He had lectured at Netley, seen service in India, and returned to his native Scotland on retirement. Bred up a staunch old Presbyterian, and by nature a rigid moralist and strict disciplinarian, he was yet a man of great tolerance, quite free from dogma; and generous in his sympathies; a great reader (though shy of fiction and poetry alike), open-minded and of liberal view, a scholar and a scientist, he was, as you may easily understand, a believer in evolution and an ardent disciple of Darwin.

I cannot enough admire our host's patient forbearance with his two school-boy guests and their sad lack of seriousness. On our first visit to him after settling in the south of England, a prolonged spell of bad weather (coupled in Slyboots' case with a touch of bronchitis) prevented us from going out very much, and we made almost daily raids on the village library for story books. My favorite author was Ballantyne, my brother's was Kingston, but neither of us had the remotest idea of how or why his favorite author made such a strong appeal to him. I fancy the doctor must have been aching to see us tackle something better worth while, but he never interfered and apparently even gleaned no small amusement from some of our frequent disputes; for I can still hear his guffaw over what I fondly imagined a shrewd stroke of mine at the close of a battle royal with Slyboots: "Well! if Slyboots would have it, the reason I liked Ballantyne best was because he gave you more for your money; there were whole chapters at the end of Kingston, and sometimes even in the

middle of the book, wasted over footling love affairs, when the hero might have had at least one more hair-raising adventure in the forests of Brazil, the Indian Jungle, the African veldt, or wherever it happened to be."

At sixteen I had outgrown these boys' books and was ripe for more substantial reading. It so happened, too, that in the previous term I had heard quite a lot about Darwin and the Theory of Evolution. It formed a subject of discussion among schoolmates on the Science side, who were actually divided into two rival camps under the leadership of this master and that, known to favour or to scout the doctrine; a special hero of my schoolboy worship, some years my senior and a prefect in the house where I spent my first few months of attendance at Dulwich College, had recently paid me a visit from Guy's Hospital in his first year as a medical student, and from him I learned some outlines of the theory; it had even been debated in my hearing at home by an elder brother in conversation with a business friend; and so it came about that the idea of Evolution figured quite prominently in the almost daily thoughts of a classical student of sixteen; and it was in answer to a question of mine that the good doctor first broached the subject and explained to his young guest as clearly and simply as might be the nature and trend of that world-revolutionizing treatise, Darwin's "Origin of Species."

And in a very few days, as it seemed, the solitary boy of sixteen with his time-old mystery of life, found sympathy and help as well as companionship in his host of nearly sixty. The doctor was very methodical and kept a series of logbooks or diaries in which he entered a summary of everything he read, even to magazine articles; these notebooks he called his "omnium gatherums." He had not a large library, as most of his reading was done by way of periodic parcels of books from Edinburgh, kept for two or three months and then exchanged. But he had a little bookcase of favorites, and after suggesting some volumes to be read in a certain order, he gave me the run of the shelves. I first read round the theory in three or four books like Robert Chambers' "Vestiges of Natural Creation," Lauder Brunton's "Bible and Science," and Samuel Laing's "Modern Science and Modern Thought;" I was then made to tackle, just as soon as I seemed ripe for it, Darwin's "Origin of Species" and "Descent of Man;" and after these came a troop of his great exponents, Huxley, Wallace, Romanes, Grant Allen, and Lubbock. When once I had assimilated some of this thought, I was promoted from the Doctor's exposition to the give-and-take boxing bouts of argument and discussion. Long before I passed from school to the university, I was as thorough-going a Darwinian as the old doctor himself and even more advanced, partly from the natural insolence of youth, and partly from wide reading in the noblest literature of all ages and lands, the fearless freedom of Greek poet and philosopher.

Together as men and equals we read and discussed Weismann and Haeckel, or shook our heads sadly over the unsoundness of Wallace's closing chapters on "Darwinism" with their "*deus ex machina*" of Spiritualism. When Huxley tilted with the clericals in the pages of the XIXth Century Magazine, we both keenly admired the skill with which he found the joints of the mediaeval armour and unhorsed his cumbrous opponents; a "bonny fechter," like Alan Breck, was that brilliant pamphleteer, and a tower of strength to the good cause, as we viewed it, of untrammelled thought—the march of Science. Unlike the

dear old doctor, my host, I had a great liking for fiction and was passionately fond of poetry; the great problem novels of the day, and indeed more recent books of mark I devoured with keep appetite, and was never tired of conning the pages of my favorite poets—Burns, Keats, Shelley, Rossetti, Swinburne and Matthew Arnold.

One great boon, I am sure, I owed to this course of systematic reading in Science. It added an intellectual interest to my long walks in solitary communion with Nature. For the habit of lonely wandering that I had formed on Slyboots' departure cannot have been entirely wholesome; there was hardly a sight or a sound in the world that did not awaken some chord of memory, and I often brooded over the past, though with more of wistful reverie than of sorrow in my mood. But as soon as the interest of this new theory took hold of me, it gave me a new outlook on Nature, and instead of brooding inwardly, my thoughts went out to Natural objects in search of illustration, to test book-theories as it were, and in this channel of activity they found a healthy and cheerful outlet.

More and more, it became a delight to mark the characteristic beauties of English scenery; the deep luxuriant lanes, the floral treasures of hedgerow and meadow, of riverbank and stream; the glories of the beech woods and groves of oak; the distant views of the breezy downs, and the wild grandeur of the Wessex moors. But always the crowning glory of the year, when Spring had blossomed into Summer, was the visit to Scotland. My favorite haunt, growing dearer season by season, was a mountain stream in the neighborhood of Bridge of Allan. Whether I took my fishing-rod or not made little difference, nor what direction I started out in; all paths seemed at last to lead to the mouth of the Wharrie burn where it merged in the river Allan, and then came an all-day tramp, up through the woods, past cataract and linn, climbing the steep glen by mossy rocks, past rowan and birch, out on to the open moor and then over the heather, till I had tracked the baby stream to its cradle in a mountain tarn, below the peaks of the everlasting hills.

As soon as I entered the University I began to gather a library for myself. One of the most treasured shelves was devoted to books of scientific theory; I made a selection of volumes from the International Scientific Series published by Kegan Paul, and became a subscriber to two new series—the Minerva Library of Famous Books, edited by G. T. Bettany, and the Contemporary Science Series published by Walter Scott; every volume of these two publications I purchased on issue and devoured at my leisure.

But my interest in Evolution never for a moment lessened the love of Natural objects or dulled the sense of mystery, of wonder, and of beauty in God's handiwork. And this emotional attitude to Nature was greatly strengthened in my student days at Oxford by a wonderful discovery that I made at the end of my second year. While travelling in the realms of gold I found that I was not alone or peculiar, had nothing to be ashamed of, in my solitary musing on the mystery of life. I found the most secret thoughts and feelings of my very soul from boyhood to manhood laid bare and given a language in two books that have been a bible to me ever since, the Poems of William Wordsworth, especially Tintern Abbey, and Richard Jefferies' Story of My Heart.

NEW BRITISH COLUMBIA TUSSOCK MOTH, HEMEROCAMPA
PSEUDOTSUGATA.BY J. MCDUNNOUGH, PH. D.
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For the past few years a species of tussock-moth has been reported as damaging the douglas fir in certain districts of British Columbia; it was determined by Mr. E. H. Blackmore in the Report of the British Columbia Provincial Museum, 1918, p. 12, as *Hemerocampa vetusta gulosa* Hy. Edw. and a figure of a rather rubbed ♂ was given on Plate 1.

An account of the extent of the devastation was also given by Mr. W. B. Anderson, in the Agricultural Gazette, 1919, VI, 139.

In the spring of 1920 I received a number of egg-masses of the species, collected by Mr. W. B. Anderson, the original discoverer, at Chase, B. C. From these I was enabled to breed a limited number of adult specimens; the young larvæ on hatching were offered hemlock and pine, douglas fir at the time not being available; a large number refused to eat and perished, but a few nibbled the blossom-buds of hemlock and fed on these until half-grown when they were transferred to douglas fir, a tree of this species having been located at the Experimental Farm. The moths emerged in the first week of July during my absence from Ottawa, an earlier date than that given by Mr. Blackmore in his account of the species, but probably due to more or less forcing of the young larvæ during the early spring.

From my present knowledge of the early stages and of the adults I cannot agree with Mr. Blackmore that the species is *gulosa* Hy. Edw. This species was described in Papilio I, 61, in a paper by Mr. Edwards dealing with the Pacific Coast species of *Orygia* (*Hemerocampa*). In this paper *vetusta* Bdv., a species described very briefly from a ♂ specimen from California which is possibly still in the Oberthur Collection at Rennes, France, and which has certainly never been satisfactorily identified by American systematists, was limited to a lupine-feeding larva of the San Francisco Bay region, whilst the name *gulosa* was proposed for an oak-feeding larva which was found abundantly throughout the foot-hills of the northern Sierras. Both larvæ were described rather inaccurately and inadequately; roughly speaking, apart from the difference in food-plants, the main points of distinction are apparently to be found in the color of the dorsal abdominal tufts; in *vetusta* the tufts on abdominal segments I-IV are described as being whitish drab at base tipped with chestnut-brown; in *gulosa* tuft I is blackish, the other three tufts being white; the dorsal tuft on segment VIII is yellow tipped with black in *vetusta* and black in *gulosa*.

In Psyche VI, 438 (1893) Dr. H. G. Dyar gives a detailed description of the early stages of *gulosa*; his description of the 3rd and 4th larval stages corresponds well with Edwards' larval description; in full grown larvæ Dr. Dyar states of the tufts that they are "coloured a silvery-grey, in some specimens blackish or even black on the crests, but white on the sides, in others nearly all white." He further is of the opinion that Edwards confused the moths resulting from the two species of larva and that the description given by Edwards of the adult ♂ *vetusta* should apply to *gulosa* and vice-versa; to avoid confusion he limits the application of

*Contribution from the Entomological Branch, Department of Agriculture, Ottawa.
March, 1921

the names to the larval forms. We thus have a lupine-feeder (*vetusta*) with whitish tufts tipped with chestnut, producing a small ♂ with indistinct maculation of primaries and an oak feeder (*gulosa*) with white tufts occasionally black-tipped, emerging into a larger ♂ with distinct maculation. A similar arrangement was followed by Neumoegeon & Dyar in their Preliminary Revision of *N. Am. Bombyces* (1894, Jour. N. Y. Ent. Soc. II, 28, 29;) later, however, in the List of *N. Am. Lepidoptera* (1902) Dr. Dyar treats *gulosa* as a variety of *vetusta*; the reason for this change is unknown to me but the arrangement was followed in the Barnes & McDunnough Check List (1917) for lack for any further data on the subject.

As neither the larva of *vetusta* nor of *gulosa* has been bred by me it is impossible to comment on the accuracy of the above statements; on the face of it, taking into consideration the larval distinctions and the difference in food-plants, I should incline to the belief that we are dealing with two distinct species; as to whether Hy. Edwards or Dr. Dyar is correct in the description of the resulting imagines remains for our California collectors to prove by careful breeding.

To return to our douglas fir-feeder I would point out that it cannot be referred to *gulosa* as the larva contradicts the description. In all the specimens reared (both ♂ and ♀) the dorsal tufts on abdominal segments I-IV were whitish, broadly tipped with chestnut-brown whilst the dorsal hair-pencil of segment VIII was black with a chestnut-brown tuft of half its length at the base anteriorly. The larva would thus correspond very closely with that of *vetusta*, according to the description, except that the hair-pencil of segment VIII could hardly be called "yellow tufted with black."

These discrepancies in the coloration of the larva and the fact that it is a coniferous feeder lead me to the belief that the species is undescribed; a parallel case is found in the closely allied genus *Olene* Hbn. where the pine-feeders are now recognized as distinct species from those feeding on deciduous trees.

***Hemerocampa pseudotsugata*, sp. nov.**

Ovum.—Laid in large clusters on the ♀ cocoon or adjacent areas, covered with a gelatinous substance to which are attached numerous dark, smoky hairs from ♀ abdomen; color white; hemispherical.

Larva, Stage I.—Resembles considerably a small *Porthetria dispar* in shape. Head large, brown, with sparse hairs; palpi and clypeus whitish. Body dirty gray, tinged with reddish laterally, tubercles represented by large chitinous patches (verrucae) containing long, slightly barbed hairs; the dorsal hairs are generally blackish, the lateral ones white. The usual Liparid wart laterally on the prothorax is very prominent with numerous long, black, hairs. Prothoracic plate large, rectangular, with two knob-like warts on the anterior edge, each bearing about 10-12 hairs arranged in a circle; several white hairs from the anterior margins of the segment overhang the head; posterior and ventrad to the plate are two minute setae closely approximated. Meso- and meta-thoracic segments with tubercles I and II narrowly separated; I small, obliquely oval with three short setae, II larger, roughly circular with about two hairs; in the lateral region are two further tubercles, very similar in size and equidistant.

On abdominal segments I-IV, VII and VIII verrucae I and II form together a large rectangle, I, narrowly separated from II, being triangular and forming the anterior dorsal corner of this rectangle; on segment II it bears five hairs, on

III three hairs and on the other segments two hairs; on abdominal segments V and VI it is reduced to a mere point with a single short, white, clubbed hair, noticeably distinct from the other setae.

Verruca II bears about ten hairs normally but on V and VI it is smaller with fewer hairs and in consequence more of the pale color of the integument is apparent; on these same segments it also bears 2-3 clubbed white hairs in close proximity to that of verruca I. Laterally a large, oblong verruca (tubercles III and IV) is present with the brown spiracle situated on its ventral edge; it bears numerous hairs, including a single long black one. Below it is a further smaller verruca clothed with short whitish hair and with one long white seta. Above the prolegs a small verruca with several short white hairs. Rear segment with four, large, equally spaced verrucae containing several long, backward-directed setae. Prolegs with two anterior and two posterior crotchets. Length on emergence 2 mm.

Stage II.—Head as before; body light gray with slight purple-brown dorsal sprinkling behind verrucae and heavy lateral sprinkling of same color; faint yellow shading on meso- and meta-thorax especially intersegmentally and also laterally along all segments below spiracle. Verrucae much as before but paler; from the large prothoracic wart arises a small tuft of short plumes as well as the bristles; verruca I on abdominal segments I and II with similar black plumed hairs and merely one or two bristles; verruca I and also II on segment VIII with a few black plumes on inner edge; otherwise the bristles from verrucae are long and mostly black; abdominal segment V with yellow dorsal shading and VI and VII dorsally with large circular yellow-orange eversible glands.

Stage III.—Head pale brownish. Body with grayish-white ground colour; dorsally the segments are shaded with dark brown forming a narrow dorsal line on thoracic segments and broadening out on abdominal to a band of dark color strongly broken with the pale ground colour and extending laterally to the lower edge of verruca II. Posterior portion of thoracic segments shaded with yellow-orange and the whole dorsum of abdominal segment V anterior to tubercles rather bright orange; glands on VI and VII bright coral-red. A broad broken band of dark brown laterally crossing verruca III, the verruca itself being encircled with pale ground color and with a patch of the same color behind it so that the edges alone of the dark band appear more or less continuous; a somewhat broken pale yellow subspiracular line below which the brown shading is predominant again. Verrucae rather pale except I and II on abdominal segments I-IV which are dark (blackish) and form a marked contrast to others which are slightly yellow tinged; short black pencils of feathered hair laterally from the large prothoracic wart; dorsal black hair pencils on abdominal segments I, II and VIII with very slight tufts of white plumed hairs on III and IV arising from verruca I. Of the barbed hairs the long ones are black, the others white, mostly all being longer than the hair pencils. Prolegs shaded basally and centrally with dark brown. Prothoracic plate tinged with yellowish. Not much increase in number of barbed hairs.

Stage IV.—Head black; clypeus and mouth parts whitish; overhung by white hairs arising from prothoracic plate. Body light gray tinged anteriorly with yellow; a dark blackish dorsal stripe on meso- and meta-thorax broadening into a more or less solid band of black on abdominal segments with segment V

bright yellow-orange dorsally. Body shaded with black in supraspiracular area and with the orange-yellow subspiracular line of previous stages well marked. Lateral black hair-pencils from prothoracic warts; dorsal black pencil from abdominal segment VIII. Well developed tufts dorsally on abdominal segments I-IV, the anterior two light brown, often shading into deeper brown apically and frequently edged laterally with white plumed hairs; the two posterior tufts smaller, generally composed of white plumed hairs; tuft 3, however, often considerably tinged with light brown; in such cases tufts 1 and 2 are generally smoky brown; abdominal verrucae bright yellow-orange, edged at base by creamy line except verruca II of abdominal segments I-IV, which is black. Long black hairs from verrucae few in number; numerous shorter hairs white. Eversible glands bright coral-red. Legs yellow-orange; venter pale yellow-gray.

Amount of dark suffusion on body variable, the ♀ caterpillar being lighter in colour than ♂.

Stage V.—Head black, with white clypeus; general ground color of body grayish caused by white suffusion on black ground with thoracic dorsal portion yellow with black centro-dorsal line; dorsum between tufts broadly black; on other abdominal segments narrowly black, in ♀ tinged with brown; dorsal tufts white at base, tipped broadly with light or dark chestnut-brown; black lateral anterior pencils as before; dorsal black pencil on abdominal segment VIII preceded by a brown recurved tuft half the length of the black pencil; a distinct subspiracular orange line; verrucae bright coral-red, shaded with black at base, ringed by whitish.

The ♀ larvæ were noticeably larger than the ♂'s but I was unable to discover that they underwent an extra moult as is generally the case in this group.

Imago ♂.—Colour dark chocolate-brown with none of the chestnut-brown shades of allied species except traces around the reniform. Considerable sprinkling of white scales rather evenly distributed over the whole wing, more especially noticeable in the apical and median areas. Usual lines well-defined and not perceptibly different in course from those of allied species; reniform more or less white-filled. Beyond the t. p. line on costa a prominent rectangular dark patch, surrounded by whitish scaling, giving rise to the irregular dark s. t. line which is more or less defined by white scaling and terminates in a small white patch above anal angle. In normally marked specimens this s. t. line is connected with the dark marginal line by a distinct dark dash through the interspace of veins 6 and 7. Secondaries dark chestnut-brown with a broad, darker brown marginal border of varying intensity. Expanse 27-30 mm.

♀. Wing-stumps and anterior half of abdomen smoky-gray, the posterior abdominal segments tufted with thick hairs of a blackish colour, much darker than the color found in allied species.

Holotype 1 ♂, Chase, B. C., bred at Ottawa, 1920, and in Canadian National Collection.

Allotype 1 ♀, Chase, B. C., bred at Ottawa, 1920, and in National Collection.

Paratypes 4 ♂'s, 2 ♀'s, from same locality in the National Collection and in the Barnes Collection, Decatur, Illinois.

The dark tufting in the ♀ and the dark ground colour of primaries of ♂ together with the dark subterminal dash in interspace 6 seem to be characteristic of the species.

NOTES ON COCCIDÆ VII. (HEMIPTERA).*

BY G. F. FERRIS,
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A REVIEW OF MACGILLIVRAY'S "THE COCCIDÆ."

The impression seems quite generally to have prevailed (the present writer must confess to not having been immune to it) that the ability to recognize a few of our common orchard, shade tree and green-house scale insects entitles its possessor to recognition as a Coccidologist. It is, perhaps, in part this circumstance that has been responsible for the fact that while there have been many who have written on the Coccidæ there have been relatively few who have had any very profound knowledge of the group. The systematic literature, although impressive in quantity, has never been so in quality, in fact only too rarely has it risen above the level of hopeless mediocrity, while all too often it has descended even to the point of utter puerility. The greatest task before the present-day students of the Coccidæ (and those for some time to come) is that of overcoming this handicap.

In the face of these conditions it is obvious that the character of any treatment of the group that is based wholly or in large part upon the literature alone will be more or less definitely predetermined. At the best it can be of a very considerable, even if but temporary, usefulness by bringing the scattered literature to a focus and serving as a sort of point of departure. At the worst, if to the errors inherent in the sources from which it is drawn there be added an undue number for which the compiler is responsible, the possibility of usefulness may, to a very large extent, disappear. Not only may the task of which I have spoken above not be lightened, it may even to some extent be increased. This I consider, on the whole, to be the effect of MacGillivray's recent book, "The Coccidæ."

I do not need to be reminded that many of the criticisms of this book that I shall express are matters of opinion. Consequently, I may be pardoned for pointing out that as a basis for the opinions that I shall present I have available what is possibly the second largest collection of Coccidæ in the United States, and that I have personally examined with varying degrees of thoroughness some hundreds of species in the group. On the other hand, MacGillivray very clearly indicates in the preface of his book that it is based chiefly upon the literature alone, and it is obvious from the text that his acquaintance with the insects themselves is relatively limited. Even the air of profundity imparted by the special terminology employed and the appearance of authority with which the material is presented cannot entirely conceal this fact.

I cannot in any paper of reasonable length deal in great detail with the book. An extended analysis must wait upon revisional studies of the various groups, and I am presenting here a consideration only of the more obvious errors and of the conclusions in which I differ most widely from MacGillivray. It is, for instance, no part of my intention to consider the many typographical errors and other evidences of carelessness, such for example as the constant misspelling of *Antonina* (pages 122, 123, 145, 146, 476) and *ariditatis* (pages 182 and 476).

*Continued from Canadian Entomologist 52:65. (1920.)
March, 1921

The most objectionable feature of the book is the great number of new genera that have been proposed in the subfamily Diaspidinae, practically all of which are based upon species that in all probability the author has never seen. That many new genera are needed in this group is undeniable, yet before the wholesale naming of them is undertaken there should first be a careful review of the types of the existing genera, and the whole work should be based upon an examination of specimens. The naming of new genera upon the basis of printed descriptions alone is not likely even under the most favorable conditions to be especially helpful. When done under the conditions prevailing in the literature of this group and in such wholesale fashion as attempted by MacGillivray it is little short of disastrous. The peculiar results that can thus be obtained will be discussed in connection with this subfamily.

It is not probable that anything approaching unanimity of opinion concerning the general classification of the Coccidæ will be arrived at for many years to come. There remain too many questions, such for instance as the taxonomic value of the various types of ducts and pores, that are still to be investigated. Doubtless, too, the discovery of new forms will profoundly change some of the present conceptions. As it is, even with the specimens before one, there are many points concerning which the cautious student will hesitate to express an opinion. Yet there are some things that are fairly clear and concerning which an opinion may be hazarded.

My own personal preference would be to regard the Coccidæ as a superfamily in the belief that a more expressive classification can thereby be obtained. However, this is a minor point. What is really desirable is to obtain a division into groups that will approximate a natural arrangement and that are somewhere near equal rank. This I consider that MacGillivray's proposed seventeen subfamilies do not do. I am unable to see that his arrangement is any special improvement over the classifications that have preceded it.

It is my contention that MacGillivray's six subfamilies, Monophlebinae, Kuwaniinae, Xylococcinae, Margarodinae, Callapappinae and Ortheziinae taken together constitute a group that is equivalent in rank to, for instance, the subfamily Diaspidinae. In working over the Coccidæ I have been impressed with the feeling that the group is at once extraordinarily conservative and extraordinarily plastic, and in no place is this paradoxical condition shown to better advantage than in the six groups mentioned above. There is throughout this group of species a persistent adherence to a certain fairly definite general type, coupled at the same time with aberrations of the most remarkable characters. It is the adherence to this general type and not the aberrations to which I am inclined to accord the most weight.

This group as a whole is characterized by the presence of abdominal spiracles. It is true that in many of the species they have not been recorded, yet there is good reason to believe that this is due simply to deficient observation. In but two genera, *Nipponorthezia* and *Newsteadia*, each with a single species, do they appear positively to be lacking.

MacGillivray in his key to the subfamilies (pp. 58, 59) separates the Ortheziinae from the other groups named above on the basis of the presence of an anal ring and anal ring setæ. As a matter of fact the anal ring is sometimes developed in the Monophlebinae, being well developed but simple in

Llaveia bowvari (Sign.) and even more strongly developed with a distinct tendency toward a cellular condition in *Greenella dalbergiae* (Green), although it bears no setae. MacGillivray further states (p. 106) that the "pilacerores" are peculiar to the Ortheziinae. Yet they constitute one of the points allying this group with the Monophlebinæ for exactly the same structures are present in; for instance, *Aspidoproctus maximus* Newst. and an apparently undescribed species of *Walkeriana* as well as in other species. Furthermore, the presence of compound eyes in the male of *Orthezia* is additional evidence to the same end.

The Kuwaniinae, Callapappinae, Margarodinae and Xylococcinae are separated from the Monophlebinæ by the absence of mouthparts in the adult female. Yet in five of the six genera included by MacGillivray in the first named group the mouthparts are present in the adult female, a fact that one drawing conclusions from the literature alone would not be aware of because of deficiencies in the published descriptions. I have elsewhere pointed out that in *Xylococcus macrocarpa* Coleman the mouthparts are at times developed in the adult female.

The extraordinary development of the anterior legs in the genus *Margarodes* is apparently an adaptive character. Certainly it is hardly sufficient to justify the recognition of this genus as constituting a group equivalent in rank to the Diaspinæ. I have seen no examples of the Callapappinae, but judging from the descriptions they too are of a Monophlebid type.

It is, of course, obvious that the group formed by the union of these six so-called subfamilies is capable of being subdivided, but this will need to be done on lines somewhat different from those that have previously been employed and on the basis of an examination of material.

In the description of the Monophlebinæ (p. 62) it is stated that the adult female never possesses an anal tube with "anacerores." Such a tube is well developed in *Gueriniella*, which MacGillivray includes in this group. He also includes under this subfamily the remarkable genus *Stictococcus*. I am unable to see in this anything of a Monophlebid character, and would rather adopt Lindinger's view, that it constitutes a separate subfamily.

Under the subfamily Kuwaniinae the new genus *Americoccus* is proposed for *Matsucoccus fasciculensis* Herbert. I have at hand specimens of this and of *M. matsumurae* (Kuwana), and cannot concur in the erection of this genus.

Concerning the restoration of the name *Coccus* to the genus which in the Fernald Catalogue is called *Dactylopius*, I cannot comment as the literature upon which a decision depends is not available. I may remark, however, that as Mrs. Fernald's work gives every evidence of having been carefully done, I should be inclined to accept her conclusions, at least until a careful review and restatement of the case has been made. With MacGillivray's assignment of this genus to a position between the Ortheziinae and the other Monophlebid forms I cannot agree. While it may very well constitute a group by itself it possesses tubular ducts of the type that occur in *Eriococcus* and related forms and that I have not seen in any of the Monophlebid forms that I have examined. The association of *Epitoccus* with this genus is dubious.

I have never been privileged to examine specimens of the female of *Phenacoleachia* but I have at hand males sent me by Professor Cockerell as belonging

to *P. zealandica*. On the basis of these males and of the meager description given by Maskell I should regard this genus as a Pseudococcine form of the general type of *Puto*. The males of these two genera are practically identical. I see no reason for retaining the subfamily Phenacoleachiinae.

The subfamily Eriococcinae as understood by MacGillivray is certainly an unnatural group, and as he has indicated (p. 126) includes at least two groups of genera. MacGillivray's remarks (pp. 122-3) indicate that he is not aware that the dorsal ostioles or "labiae" do not occur in *Eriococcus* and the genera related to it. They are in fact confined to the genera of which *Pseudococcus* may be taken as the type, and I regard their possession as of sufficient importance to justify a distinction between these two groups. On the other hand, MacGillivray has excluded from the Eriococcinae the genus *Kermes*, which I regard as strictly Eriococcine. I shall consider this point under the discussion of the subfamily Kermesinae.

The subfamily or group associated with *Eriococcus* includes the following genera of the position of which I feel sufficiently sure to hazard an opinion: *Atriplicia*, *Cryptococcus*, *Eriococcus*, *Fonscolombia*, *Gymnococcus*, *Gossyparia*, *Kermes*, *Micrococcus*, *Olliffiella*, *Rhizococcus* and *Xerococcus*. The group associated with *Pseudococcus* contains the following: *Antonina* (= *Chaetococcus*), *Cryptoripersia*, *Erium*, *Geococcus*, *Helicoccus*, *Heterococcus*, *Lachnoidius* (at least in part), *Macrocepococcus*, *Naiacoccus*, *Natalensia*, *Nesococcus*, *Phenacoccus*, *Porococcus*, *Pseudococcus*, *Puto* (= *Ceroputo* = *Macrocerococcus*), *Ripersia*, *Ripersiella*, *Rhizococcus*, *Sphaerococcus*, *Trionymus* and *Tylococcus*.

Ehrhornia, *Paludicoccus* and *Kuwanina* are of doubtful affinities, but I feel sure do not belong in either of the above groups. *Cissococcus*, as I have pointed out in an earlier number of these notes is a Lecaniine form. The species described by Ehrhorn as *Cissocossus* (?) *oahuensis* has since been referred by Ehrhorn to a new genus, *Phyllococcus*, which has been overlooked by MacGillivray. I have at hand specimens of this species but prefer not to express any opinion as to its relationships.

The other genera included by MacGillivray in his Eriococcinae I have not seen specimens of, nor in some cases the descriptions, and I refrain from commenting upon them.

I may note a misstatement on page 142. It is there said that "Ferris believes that the American *Phenacoccus stachyos* Ehrh. is congeneric" with *Coccurea comari* (Sulc). It is *Helicoccus bohemicus* Sulc with which I have compared *P. stachyos*.

In regard to the Tachardiinae I may simply note that the statement that the body is not provided with pores, "cerores," or with tubular ducts, "ceratubae," except on the stigmatic and anal processes is entirely erroneous as an examination of carefully stained specimens will quickly show. MacGillivray has adopted Cockerell's groups and although these will stand they will not do so on the basis of the characters used.

The keys and discussion of the Lecaniinae are based entirely upon the literature and no new genera are named. I may note only that the anomalous genus *Aclerda*, which probably does not belong in this group is included without special comment, and that it is stated (p. 175) that in this genus the anal cleft and opercula are wanting. The anal cleft is present and bears at its anterior

end a single undivided plate. Also no mention is made of the fact that in *Physokermes* the opercula are wanting in the adult female, in fact (p. 175) it is said that the adult female has the "opercula prominent, swollen, dorsal in position." The structures referred to are not the opercula, which are lacking in this stage.

Concerning the Asterolecaniinae I shall note only that to it is referred the genus *Olliffiella*. I reaffirm the opinion which I have formerly expressed, that this species is closely related to *Kermes* and should accompany the latter wherever it may be placed.

The subfamily Kermesinae is based upon the single genus *Kermes*. As I have previously indicated I regard this genus as strictly Eriococcine, and see no reason for the subfamily Kermesinae. I may note that MacGillivray's statement (p. 191) that the anal ring is wanting in the adult female is erroneous. In *K. cockerelli*, *kingii*, *nigropunctatus* and *vermilio*, at least, the anal ring is well developed in the adult female, although it bears no setae.

(To be continued.)

A SYNOPSIS OF THE NORTH AMERICAN SPECIES OF THE GENERA MELANOCHELIA RONDANI AND LIMNOPHORA R.-D. (DIPTERA, ANTHOMYIIDÆ.)

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This group is the *Limnophora* of authors, the name *Limnophora* being applicable to the species which have the prosternum and base of third vein setulose; the other segregate requires a change of name and apparently Rondani's name must be used.

The species of *Melanochelia* occur most commonly in the north and usually along the margins of lakes or streams. *Limnophora* occurs more commonly in the south, many species being found in the tropics throughout the world, and even very frequently on small islands far removed from the large land masses. The larvæ are, so far as I know, aquatic.

Melanochelia Rondani.

KEY TO SPECIES.

1. Thorax with four pairs of postsutural dorsocentral bristles; halteres yellow (cf. *obsoleta*).....2.
- Thorax with four pairs of postsutural dorsocentral bristles; halteres black or brown.....13.
- Thorax with three pairs of postsutural dorsocentral bristles.....19.
2. Orbital hairs descending much below level of base of antennæ; facial ridges haired about midway to base of antennæ; basal abdominal sternite haired.....*Lispoides aequalis* (Stein).
- Orbital hairs not descending below base of antennæ.....3.
3. Basal abdominal sternite with some setulose hairs; fourth wingvein usually slightly curved forward at apex.....*Eulimnophora* Malloch.
- Basal abdominal sternite bare.....4.
4. Eyes of male separated by much less than distance across posterior ocelli; sternopleurals 1:1; anterior acrostichals in two series; hind tibia with one anterodorsal and one anteroventral bristle.....*torreya* Johannsen.

- Eyes of male separated by as great a distance as width across posterior ocelli; characters not in all respects as above.....5.
- 5. Males.....6.
- Females.....11.
- 6. Calyptre dark brown; eyes separated by one-third of the head-width; frons velvety black; hind femur with bristles on entire length of posteroventral surface.....*velutina* Malloch.
- Calyptre whitish or yellowish; species not as above in other respects.....7.
- 7. Small species, not over 4 mm. in length, densely white pruinose; presutural acrostichals strong, two-rowed; females of known species without paired spots on abdomen, and the genitalia with two or four short thorns at apex.....8.
- Larger species, over 5 mm. in length, brownish gray pruinose; presutural acrostichals in at least three series; females without thorns on genitalia.....9.
- 8. Fourth abdominal tergite distinctly longer than third; cheek but little higher than width of parafacial at base of antenna; abdomen silvery, third tergite without paired spots.....*argentiventris* Malloch.
- Fourth abdominal tergite not longer than third; cheek twice as high as width of parafacial at base of antenna; abdomen whitish gray, not silvery, third tergite with a pair of small spots.....*brevicornis* Malloch.
- 9. Hind femora with long bristles on antero- and posteroventral surfaces, those on the latter finer than on the former, and not extending to base.....*novæ-anglæ* Malloch.
- Hind femora with at most very short bristles on posteroventral surface, those on anteroventral long and strong, but confined to apical half.....10.
- 10. Hind femur with a number of short, erect bristles on median portion of posteroventral surface; eyes separated by less than width across posterior ocelli; each orbit as wide as interfrontalia.....*gibsoni* Malloch.
- Hind femur without median posteroventral bristles; eyes separated by width across posterior ocelli; each orbit about half as wide as interfrontalia.....*monticola* Malloch.
- 11. Lower calyptre hardly protruding beyond upper; costal setulæ longer than diameter of costal vein.....*obsoleta* Malloch.
- Lower calyptre projecting much beyond upper; costal setulæ not as long as diameter of costal vein.....12.
- 12. Small species, not over 4 mm. in length; thorax and abdomen with grayish white pruinoscence, without dorsal spots; genitalia of female with some strong apical thorns.....*brevicornis* Malloch.
- Larger species, averaging over 5 mm. in length; thorax and abdomen with brownish pruinoscence, the former vittate, the latter with paired dorsal spots.....*nobilis* Stein.
- 13. Presutural acrostichals consisting of two very closely placed, rather irregular series of short setulæ; abdomen with a linear dorsocentral black vitta and black paired dorsal spots; basal segment of hind tarsus a little less than half as long as hind tibia; basal separation of antennæ linear.....*tetrachæta* Malloch.
- Presutural acrostichals consisting of four or more series of fine hairs;

- abdomen with paired dorsal spots which are sometimes fused or without distinct spots, and never with a dorsocentral vitta.....14.
14. Calyptræ exceptionally small, the lower one not twice as large as the upper; abdomen with the dorsal spots so greatly enlarged as to cover the entire dorsum except the extreme posterior margin of each tergite; costal hairs setulose, very distinctly longer than diameter of costal vein; vibrissal angle not noticeably produced beyond line of base of antennæ.....*obsoleta* Malloch.
- Calyptræ large, the lower one twice as large as the upper; abdomen with distinct paired dorsal spots; costal setulæ minute; if the abdomen is indistinctly spotted the vibrissal angle is produced much beyond a vertical line drawn from base of antennæ.....15.
15. Vibrissal angle but little produced, almost in vertical line with base of antennæ.....16.
- Vibrissal angle very conspicuously produced beyond vertical line from base of antennæ.....17.
16. Small species, not 4 mm. in length; abdomen unspotted, the entire body with whitish pruinescence; genitalia with 4 short thorns.....*brevicornis* Malloch.
- Larger species at least 5 mm. in length; abdomen with large black paired spots, the entire body with brownish pruinescence.....*nobilis* Stein.
17. Hind femur with 4 or 5 moderately stout, long bristles on apical two-fifths of anteroventral surface; last section of fourth vein three times as long as preceding section; veins 2 and 4 up to outer cross-vein and both cross-veins tinged with brown along their courses.....*pearyi* Malloch.
- Hind femur with long, hair-like bristles from base to apex on anteroventral surface; last section of fourth vein less than twice as long as preceding section; veins not tinged with brown.....18.
18. Large species, at least 6 mm. in length; female orbits with rather dense bristly hairs laterad of the bristles, the hairs almost as long as the bristles; wings of male rather pointed at apices.....*angulata* Malloch.
- Smaller species, not over 4.75 mm. in length; female with short sparse hairs laterad of the bristles on orbits; wings of male rounded at apices.....*extensa* Malloch.
19. Calyptræ dark brown; wings distinctly infuscated; eyes of male separated by much less than width across posterior ocelli.....*anthrax* Bigot.
- Calyptræ whitish; halteres yellow; wings usually clear.....20.
20. Eyes separated by almost one-third of the head-width; hind femur without posteroventral bristles; the paired dorsal abdominal spots with a connecting brown patch between them.....*caroli* Malloch.
- Eyes separated by much less than one-third of the head-width; abdominal dorsal spots not as above.....21.
21. Hind tibia with one or more setulæ at or near middle on posterodorsal surface.....22.
- Hind tibia without setulæ on posterodorsal surface.....27.
22. Tibiæ pale, reddish; wings clear, veins pale; abdomen narrow, cylindrical, the dorsal spots of moderate size, widely separated; fore tibia with a median posterior bristle.....*suspecta* Malloch.

- Tibiæ black; wings usually infuscated, more distinctly so basally, veins black; abdomen ovate except in *alticola*, the dorsal spots large, separated by a linear space; fore tibia without a median posterior bristle except in *alticola*.....23.
- 23. Eyes separated by more than twice the width across posterior ocelli; hind femur with long bristly hairs on basal half of posteroventral surface.....24.
- Eyes separated by less than twice the width across posterior ocelli.....25.
- 24. Fifth abdominal sternite with a chitinous protuberance near apex on each side of posterior excavation; mid femur without strong bristles at base on posteroventral surface.....*acuticornis* Malloch.
- Fifth abdominal sternite without such protuberance; mid femur with strong bristles on basal half of posteroventral surface.....*surda* Zetterstedt?.
- 25. Abdomen cylindrical, slightly tapered apically; hind femur with long bristly hairs on basal half of posteroventral surface; eyes separated by more than width across posterior ocelli.....*alticola* Malloch.
- Abdomen ovate; hind femur without long bristly hairs on posteroventral surface; eyes separated by less than width across posterior ocelli.....26.
- 26. Fifth abdominal sternite with sparse setulose hairs laterad and distad of base of posterior excision; abdominal dorsal spots separated by a linear space.....*magnipunctata* Malloch.
- Fifth abdominal sternite with very dense short setulæ laterad and distad of base of posterior excavation; the dorsal abdominal spots on third and fourth tergites rather widely separated, much more so than those on second.....*imitatrix* Malloch.
- 27. Thorax when viewed from behind with the anterior half of disc brownish black, the posterior half densely gray pruinose; abdominal dorsal spots narrow, elongate, sometimes linear; mid tibia without an antero-dorsal bristle; hind femur unarmed on posteroventral surface.....*clivicola* Malloch.
- Thorax deep black when viewed from behind, only the posterior margin grayish pruinose; abdominal dorsal spots large and broad; mid tibia with one or more anterodorsal bristles; hind femur with some short, stout bristles on median third of posteroventral surface.....*gibsoni* Malloch.

Limnophora Robineau-Desvoidy.

KEY TO SPECIES.

- 1. Fifth abdominal sternite in male much longer than fourth; male hind femur incrassated at base and apex.....*incrassata* Malloch.
- Fifth abdominal sternite in male not longer than fourth; femora normal..2.
- 2. Eyes of male narrowly separated, the frons not wider than third antennal segment; first posterior cell of wing much narrowed apically.....*narona* Walker.
- Eyes of male separated by more than width of third antennal segment; first posterior cell of wing almost imperceptibly narrowed apically....3.
- 3. Female with an anterodorsal bristle on mid tibia.....*groenlandica* Malloch.
- Female without an anterodorsal bristle on mid tibia.....*discreta* Stein.

FURTHER NOTES ON EVENING FLOWERS, PANURGINE AND HALICTINE BEES.

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The present paper is supplementary to two previously published on these forms (Can. Ent. 51:205-210, Ent. News 31:35-44). Through the kind co-operation of my friend Dr. J. F. Brenckle I was able to make a fourth visit to the sand hills near Sheldon, North Dakota, and succeeded in obtaining the females of *Hesperapis carinata* and *Perdita tridentata*.*

Notes on nesting of *Agapostemon splendens* were also secured and these with data on the other species and of *Augochlora* in North Dakota are presented. I am inclined to regard these two groups as subgenera of *Halictus* as has been done by Ducke and Viereck.

No further data of interest on other panurgine bees in North Dakota has been obtained, but the absence of *Greeleyella* at Rugby might be noted. It was looked for there on June 30th to July 4th, but is doubtless an austral species which does not extend quite that far (see Am. Journ. Bot. 7:231-242 for notes on distribution of plants in the state).

***Hesperapis carinata* Stevens.**

1919. *Hesperapis carinata* Stevens, Can. Ent. 51:209, male.

Female.—Length about 12 mm. Very similar to male but stouter, hair bands of abdomen prominent and cream coloured. Face sub-quadrate, sparsely hairy on occiput, sides, around antennæ bases, sides and anterior edge of clypeus; clypeus bare or nearly so on median part; shining, rather finely but not very closely punctured; vertex smooth and shining, antennæ reddish beneath, browner above, mandibles toothed.

Mesoscutum inclined to be bare medially with a few, short, dark hairs. A well developed scopa of rather stiff, short-branched hairs on posterior tibia and basitarsus (femur and trochanter with only a few short hairs) that of the basitarsus distinctly parted on posterior edge (Fig. 1-b). Sixth dorsal segment narrowed, truncate, somewhat concave with a low raised triangle on basal middle (Fig. 1-c); laterally this segment is pubescent as in the male, the dorsal concave surface slightly striate. Wing nervures a variable pale brown, darker than in the male.

Nine specimens at flowers of *Helianthus petiolaris* in the sand hills near Sheldon, North Dakota, Aug. 21, 1920. Allotype No. 12688. When first attempting in 1916 to determine this bee, I was much puzzled as to its generic position, unless it belonged in *Hesperapis* of which I had neither descriptions nor specimens. Prof. Cockerell reported it as a new species of *Halictoides*. Mr. J. C. Crawford, however, when specimens were sent to the U. S. National Museum, wrote that it was a *Hesperapis* and called attention to the Y-shaped carina as distinctive. The general appearance of both sexes is much that of a *Colletes*. The stigma is poorly developed and is pale medially. The scopa is not similar to our other panurgines and the cleft in that of the basitarsus is unique as far as I know.

*Types and allotypes of these are in U. S. Nat. Mus.; a paratype and metatype of *Hesperapis*, metatypes of *Hesperapis*, *Perdita* and *Halictus oenotheræ* in Acad. Nat. Sci. of Phila.

March, 1921

The type of *Hesperapis* (*H. laræ* Ckll.) was described as parasitic, but Prof. Cockerell writes that such idea was erroneous. None of the *carinata* females were carrying a full load of pollen, although two seem to have a small amount which had been moistened. I believe it is a regular *Helianthus* bee and that it was yet early for them to be collecting. The day was not very favorable although some species of *Perdita* and *Andrena* were busily collecting on the sunflowers. None of the females had been found on a warm, windy afternoon two days before (two males on each day). This, the fourth visit to the place, was made later this year, bearing in mind the general rule of protandry and the extreme case of the closely related *Rhophites* as cited by Friese (Zool. Jahr., 1890). Several males were taken Aug. 10, 1919, inactive on the sunflowers' heads all day.

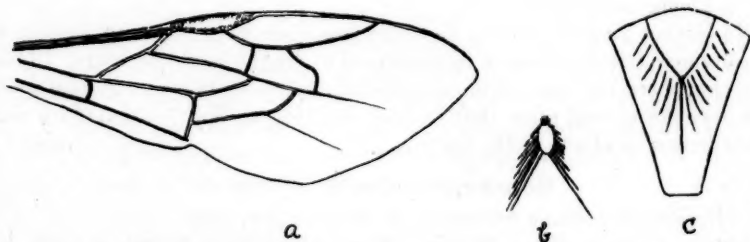


Fig. 1. *Hesperapis carinata*, female; a, forewing; b, hind basitarsus in cross-section; c, sixth dorsal segment of abdomen.

***Perdita tridentata* Stevens.**

1919. *Perdita tridentata* Stevens, Can. Ent. 51:206, male.

Female.—Length about 6 mm. Similar to the male; head and thorax bronzed greenish blue, clypeus, legs and abdomen dark brown. Face without yellow markings, mandibles reddish, antennæ yellowish beneath, brownish above; abdomen with transverse yellow spots on second and third segments, the first usually with smaller ones; fore tibiae with a yellow stripe.

Sixteen specimens at *Helianthus petiolaris* in the sand hills near Sheldon, N. D., Aug. 28, 1920. Allotype No. 12662. The spots on first segment are sometimes absent or nearly so, sometimes proportionately as large as the others, which are separated by a space about equal to their length. The females were collecting pollen. It took also 5 males, and on Aug. 10, 1919, at same place on the same flowers, 2 males.

This seems to be close to *sexmaculata* Ckll. (1895) and its var. *punctata* Ckll. (1896), but I judge probably distinct. It has no spots on segment 4, mandibles not yellow, stigma hyaline medially, cubital and discoidal nervures not especially produced, tarsi all dark. Mr. E. T. Cresson Jr., has compared specimens with the type of *sexmaculata* and reports: "*tridentata* has more granulose bronze vestiture; the other being polished with scarcely any bronze. *Sexmaculata* abdominal spots are round or slightly transverse, and are also present on segs. 4-5. Its fore tibiae are yellow in front and black behind."

***Agapostemon viridulus* (Fab.)**

Fargo, Nicholson, Monango, Glen Ullin, Mott, Marmarth, Dickinson

and Minot; 26 females, June 25, July 1, 3, 4, 7, 14, 16, 18, 25 and 27 at flowers of *Brauneria pallida*, *Carduus undulatus*, *Lactuca pulchella*, *Onagra strigosa*, *Opuntia humifusa*, *Petalostemon purpurea*, *Rosa*, *Sisymbrium altissimum* and *Taraxacum taraxacum*; 5 males, Sept. 15, 20, and 25 at flowers of *Aster chinensis*, *A. paniculatus* and *Helianthus maximiliani*.

Agapostemon radiatus (Say).

Fargo and Mandan; 14 females, May 14, 26, June 17, 26, Aug. 7, Sept. 8 at flowers of *Dracocephalum parviflorum*, *Erigeron philadelphicus*, *Oxalis stricta*, *Physalis ixiocarpa*, *Ribes missouriensis*, *Rosa*, *Salix*, *Symphoricarpos occidentalis* and *Taraxacum taraxacum*; 21 males, Aug. 7, 11, 13, 25, Sept. 6, 8, 11, 15, 18, 27 and Oct. 15, at flowers of *Aster paniculatus*, *A. sagittifolius*, *Bidens frondosa*, *B. vulgata*, *Grindelia squarrosa*, *Medicago sativa*, *Melilotus alba*, *Physalis ixiocarpa* and *Physostegia parviflora*.

Also females from Minneapolis, Minnesota, at *Aquilegia* (Nevada S. Evans), Webster City, Iowa, on *Syringa vulgaris* (J. R. Campbell), and Blue Rapids, Kansas, *Oxalis stricta* (Edna M. Stevens); a male from Blue Rapids at *Helianthus tuberosus*.

Agapostemon texanus (Cress.).

Fargo, Venlo, Lisbon, Nicholson, Monango, Oakes, Kulm, Gascoyne, Bowman, Valley City, Jamestown, Mandan, Glen Ullin, Mott, Dickinson, Washburn, Pleasant Lake, Minot, Williston, and Schafer; 92 females, Apr. 29 May 5, 11, 13, 17, June 2, 4, 5, 14, 16, 26, 28, July 1, 3, 4, 7, 10, 11, 18, 21, 25, 26, 27, Aug. 9, 12, 13, 17, Sept. 5, 10, 17, Oct. 22 and 31; at flowers of *Aster chinensis*, *Brassica arvensis*, *Brauneria pallida*, *Cactus viviparus*, *Carduus undulatus*, *Centaurea jacea*, *Cerastium arvense*, *Chrysopsis villosa*, *Dracocephalum parviflorum*, *Erysimum asperum*, *Gaillardia aristata*, *Gaura coccinea*, *Grindelia squarrosa*, *Helianthus annuus* (cult.), *H. petiolaris*, *Homalobus tenellus*, *Lactuca pulchella*, *Malvastrum coccineum*, *Medicago falcata*, *M. sativa*, *Onagra strigosa*, *Opuntia humifusa*, *Pentstemon albidus*, *P. gracilis*, *Prunus americana*, *Ratibida columnaris*, *Ribes setosum*, *Rosa*, *Rudbeckia laciniata*, *Senecio perplexus*, *Spiraea salicifolia*, *Symphoricarpos occidentalis*, *Taraxacum taraxacum*, and *Trifolium repens*; 37 males Aug. 7, 11, 13, 14, 17, 18, 24, 25, 30, 31, Sept. 5, 6, 8, 10, 13, 15, 17, 19, 20, 21, 27, Oct. 1, 14, 22, 27 at flowers of *Allionia hirsuta*, *Aster chinensis*, *A. laevis*, *A. multiflorus*, *A. paniculatus*, *Boltonia asterioides*, *Centaurea jacea*, *Erucastrum pollichii*, *Grindelia squarrosa*, *Gutierrezia sarothrae*, *Helianthus maximiliani*, *Physalis ixiocarpa*, *Physostegia parviflora* and *Sideranthus spinulosus*.

This is by far the most common species of the group in North Dakota and one of the most common bees. The earliest Fargo record which I have is Apr. 29, 1913, (C. H. Waldron). The October records are all in 1915, but the past year a male was seen Oct. 20, and both sexes quite abundant in the early part of the month, the fall having been mild except for one heavy frost on Sept. 29.

A single female from Ft. Douglas, Utah, (J. F. Brenckle, May 5, 1918, at *Balsamorhiza sagittata*) differs somewhat in the sculpture of the propodeum. It has a fairly distinct enclosure, from which run laterally about a dozen prominent ridges, converging slightly on the angle.

I have also 6 females from Denver, Colo., 3 at *Cleome serrulata* and 1 at *Sisymbrium altissimum* (Edna M. Stevens, July 5, 1915). Two of these and

one or two of the North Dakota specimens show rather straight, coarse ridges on the propodeum, on the rest it is more reticulate with fine ridges, an enclosure often suggested but not well developed.

Agapostemon splendens (Lep.).

Fargo, 3 females Oct. 15, 21 and 27, 1915, at *Grindelia squarrosa* and *Taraxacum taraxacum*; Sheldon, Aug. 28 and 30, 1920; 5 females; 5 males at Sheldon, Aug. 10, 1918, and one at Sentinel Butte Aug. 30, 1914. The male from Sentinel Butte and one of those from Sheldon have the first abdominal segment entirely black at base instead of yellowish medially.

In the sand hills near Sheldon this bee was found nesting on the sides of a "blow out" where the sand was fairly stable and sparsely covered with grass tufts. A female was seen at a hole so I decided to attempt an excavation of a similar opening. The one selected showed particles of pollen near the opening. The shaft proved to be about 8 mm. in diameter and vertical for about 1 m. Here it was lost but a lateral was found which extended irregularly somewhat backward and downward for about 3 dm. Two other similar branches, supposedly of the same shaft were found, the second about 6 cm. below the first. An enlargement of the end of the branch formed the single cell which was smooth within but fell to pieces at a touch. A ball of pollen found in No. 2 was nearly spherical, 8 mm. in diameter. The first contained pollen but was disturbed in digging, the second apparently spoiled pollen.

Three other nests were opened and in each the female was found working on the vertical shaft, two at a depth of 1 m., and one at 1.5 m. Many other similar openings were seen, perhaps one or two per meter in suitable parts of the bank. Some were open, some closed, usually surrounded by a very small handful of sand.

Augochlora confusa (Rob.).

This is not at all common. I took at Fargo a female at *Hydrophyllum virginicum*, another at *Zizia aurea* on June 14, 1913; one at *Grindelia squarrosa*, Aug. 17, 1911. On June 23, 1917, I found them quite abundant, collecting pollen of *Erigeron philadelphicus*; on Aug. 25, and Sept. 11 of same year common at *Aster paniculatus*, also *A. laevis*, *Solidago canadensis*, and *Vernonia fasciculata*; males at *Helianthus maximiliani*, *H. tuberosus*, and *Solidago canadiensis*.

Halictus texanus (Cress.).

My sister, Edna M. Stevens, sent me females taken at Blue Rapids, Kans., May 30, 1920, the same place that I found them the year before (Ent. News 31:36). She found them abundant at the *Megapterium* flowers about 7.30 p.m., but saw only one at 8.30. On June 10, at another place about two miles distant she found them at 8.30, a single one at *Achillea millefolium*.

Halictus oenotheræ (Stevens).

Three females, May 30, 1920 (with the *texanus*), one bearing a full load of pollen as I have described for *texanus*.

Halictus aberrans (Crawford).

A small amount of data relative to time of flight (females only) and opening of *Gaura coccinea* flowers was obtained the past season at Rugby, N. D.

- June 29, 6 p.m.—flowers opening, bees active.
 " 29, 6 " —bees less active; sunset at 8.40.
 " 30, 7-8 a.m.—a few bees.
 " 30, 5 p.m.—no flowers open, several bees at old ones; old flowers removed from three plants.
 " 30, 6 " —5, 5, and 6 flowers open on the 3 plants; bees active.
 " 30, 7 " —9, 18, and 13 flowers open on the 3 plants.
 " 30, 8 " —2, 6 and 2 flowers open on the 3 plants.
 " 30, 9 " —0, 0 and 0 flowers open on the 3 plants; no bees.

This shows clearly that the main period is from one to two hours before sunset. Some plants of *Anogra pallida* were watched at same time. Three flowers opened at 9 p.m., but no visitors were seen in the next half hour. One specimen of *Autographa falcifera* Kby., apparently the moth referred to (Ent. News 31:43), was taken at *Gaura* in the evening, two of *Rhodophora florida* Gn. at *Anogra* in the morning (det. by Henry Skinner and deposited in the Acad. Nat. Sci. collection).

A NEW GENUS AND A NEW SPECIES OF SPIDERS IN THE GROUP PHRUROLITHEÆ.

BY RALPH V. CHAMBERLIN,
Cambridge, Mass.

Phruronellus, gen. nov.

Proposed for a group of species heretofore included in *Phrurolithus*. The males are characterized by having near the proximal end of the femur, or sometimes at the middle, beneath, a conspicuous but short apophysis which is usually bent at the end, in place of the simple swelling at the distal end of femur present in species of *Phrurolithus* sens. str. Also by having the tibial apophysis with two distinct prongs united at base. The cephalothorax is more nearly circular in outline, the head region less narrowed, and differing in being uniformly dark

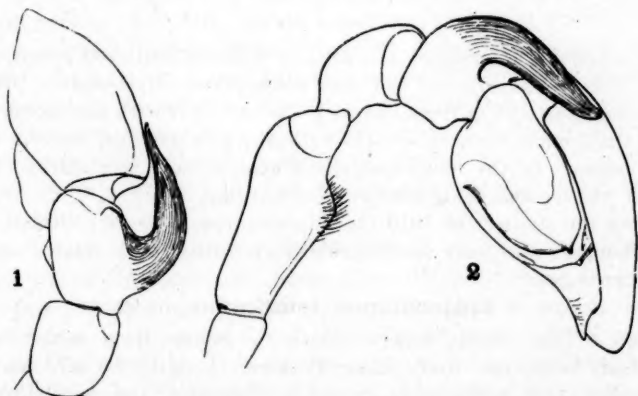


Fig. 1. *Phrurolithus parallelus*, sp. nov. (1) dorsal view, (2) sublateral view of male palpus.

shiny chestnut or blackish, without any definite markings such as are present in *Phrurolithus*. First legs without the tibiae conspicuously black, as in the latter

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genus. Femora usually darker than distal joints, especially on first two pairs of legs. Abdomen also dark above with markings obscure or absent.

Genotype.—*Phrurolithus formica* Banks.

Other known species in this genus are *pugnatus* (Emerton) and *similis* (Banks), the *Phrurolithus affinis* of Banks being the same species as the *pugnatus* of Emerton. The North American species remaining in *Phrurolithus* sens. str. are *alarius* (Hentz), *borealis* Emerton, *minutus* Banks, *parvus* (Hentz), probably *bitcheri* Petrunkevitch, which species is unknown to me, and the new species described below.

***Phrurolithus parallelus*, sp. nov.**

Male.—Carapace yellow, lateral margins black, sides a little dusky, with deeper branched lines as in *borealis*. Legs yellow excepting the first pair which have the femur, patella and tibia, excepting the light distal end of latter, darkened, the tibia darkest. Sternum yellow. Abdomen above dark, almost black, without markings, pale beneath with two darker lines united in front of spinnerets and extending forward to middle. Abdomen narrow with anterior corners angular and the margin between them but little convex, the sides subparallel. Femur of male palpus with a rounded swelling beneath at distal end covered with stiff hairs, this not limited on ectal side by a non-pilose, keel-like elevation such as is present in *alarius*. Tibial apophysis geniculate at base as usual, rather short, of gradually decreasing width to acute apical part, the latter not bent or twisted. (See Fig. 1.)

Length, 2.3 mm. Length of cephalothorax, 1 mm.; width .86 mm. Length of tib. +pat. IV, 1.4 mm.; of tib. +pat. I, 1.23 mm.

Locality.—Washington, Wawawai. One male.

NEW PARASITIC HYMENOPTERA OF THE SUBFAMILY
ANTEONINÆ (DRYINIDÆ).

BY F. A. FENTON,
Ames, Iowa.

The *Anteonina*¹ comprises a small but well-differentiated group of hymenopterous insects parasitic on leaf and treehoppers (*Homoptera*). One of the striking characteristics of these insects is the fact that with the exception of one tribe, all the females have the anterior tarsal joints modified to form a chela or grasping organ. In the more specialized genera there is a marked sexual dimorphism, the females being wingless and ant-like.

During the summer of 1919 the following species were collected or reared from leafhoppers and have been carefully compared with related species and are considered new.

***Epigonatopus americanus*, n. sp.**

Female.—This species differs greatly in colour from *solitarius* Perkins and in body sculpture from *fallax* Perkins. Length 2.5–2.75 mm. Black except tips of coxæ, trochanters, generally tibiæ and tarsi, basal three to four antennal joints, and face below base of antennæ, which are testaceous. Antennæ twice length of head. Vertex of head flat; surface of head and prothorax

1. This group has been variously given the rank of family (*Dryinidæ*) and subfamily (*Anteonina*) by different writers. It is also included by some in the superfamily *Proctotrupoidea* and by others in the *Vespoidea*.

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polished and with minute punctures, thoracic constriction minutely tuberculate, anterior half of propodeum smooth and polished dorsally, posterior half densely and minutely punctate. Abdomen smooth and polished. Thorax with few scattered hairs, these more numerous ventrally.

Described from five specimens collected by E. D. Ball, Ames, Iowa, July 25, 1919. This species was found associated with *Balclutha impicta* Van Duzee nymphs and was probably parasitic on this insect since this was by far the most abundant species of leafhopper on an annual species of *Panicum*. Owing to the large series of specimens the writer was able to dissect for the character of the mouth parts and the maxillary palp was found to be very short and two-jointed. This fact places this species in the genus *Epigonatopus* Perkins in which there are but two species described, *solitarius* and *fallax* from Australia.

Gonatopus agropyris, n. sp.

Female.—Comes nearest to *bicolor* Ashm. but differs especially in colour of abdomen. Length 2 mm. Testaceous, except basal three joints of antennæ and abdominal petiole which are fuscous. Abdomen varies from partly to entirely fuscous. Antennæ short, slightly longer than head. Head and prothorax smooth and polished, thoracic constriction and central elevated part of propodeum minutely punctate, anterior part of propodeum rugose, posterior part distinctly transversely aciculated. Abdomen smooth and polished.

Male.—Length 2.3 mm. Black, body covered with fine scattered hairs; antennæ as long as head and thorax together, pubescent. Maxillary palpi extending almost to posterior margin of head, with three joints visible; mandibles fuscous. Antennal joints 1 and 2 subequal, together being slightly shorter than 3; 3, 4, 5 and 6, subequal, each succeeding joint slightly shorter than preceding; 7-10 shorter, subequal. Ocelli all visible from above. Prothorax not visible from above; eyes pubescent; mesothorax shining and very finely reticulate. Parapsidal furrows distinct, converging and meeting at posterior margin of mesothorax; scutellum much shorter than mesonotum, smooth and polished; propodeum distinctly rugose. Wings hyaline, and clothed with fine hairs. Venation pale, radius curved, extending almost to margin of wing.

Described from one male and two females reared from *Deltocephalus affinis* nymphs collected by the writer at Ames, Iowa, July 19 and September 25, 1919.

A female reared from *Deltocephalus affinis* adult collected by the writer at Ames, Iowa, September 24, 1919, is apparently the same species. In coloration and body sculpture it is practically identical but it is somewhat larger, measuring 3 mm. in length.

Gonatopus similis, n. sp.

Female.—Resembles *mimoides* Perkins but differs in character of thoracic and propodeal sculpturing. Length 3 mm. Testaceous, except basal two joints of antennæ, vertex around ocelli, petiole, and posterior half of abdomen which are fuscous to black. Antennæ long, two to three times length of head. Head and prothorax smooth and polished. Thoracic constriction minutely tuberculate, propodeum finely reticulately sculptured. Abdomen smooth and polished. Thorax and abdomen with scattered hairs.

Described from a single specimen reared from *Deltocephalus affinis* nymph collected July 24, 1919, at Ames, Iowa.

ADDITIONS TO AGRILUS BIBLIOGRAPHY.

BY C. A. FROST AND H. B. WEISS,
New Brunswick, N. J.

The following references were inadvertently omitted from the bibliography published in this journal September and October, 1920.

A. subtropicus Schaeffer.

Schaeffer, Sci. Bul. Mus. Brook. Inst., vol. I, p. 131, 1905.

Collected on *Momis* pallida (Schaeffer).

A. huachucae Schaeffer.

Schaeffer, Sci. Bul. Mus. Brook. Inst., vol. I, p. 150, 1905.

On oak (Schaeffer).

A. dolli Schaeffer.

Schaeffer, Jour. N. Y. Ent. Soc., vol. XII, p. 210.

Taken from branches of *Acacia flexicaulis* (Schaeffer).

A. quercus Schaeffer.

Schaeffer, Sci. Bul. Mus. Brook. Inst., vol. I, p. 150, 1905.

On oak (Schaeffer).

CORRECTION OF A STATEMENT CONCERNING THE TERMINAL ABDOMINAL STRUCTURES OF MALE INSECTS.

BY G. C. CRAMPTON, PH. D.
Massachusetts Agricultural College, Amherst, Mass.

The statement that the gonopods (outer claspers, representing modified styli) of male insects probably represent the dorsal valvulae of the ovipositor of the female (Canadian Entomologist, LII, 1920, p. 180) is somewhat misleading, and should be corrected. The gonopods of the male probably represent the *styli* borne at the tips of the dorsal valvulae of the ovipositor of the immature females of certain roaches, phasmids, grylloblattids, etc., (or the adults of certain sawflies, Odonata, etc.), rather than the dorsal valvulae themselves, and it is, therefore, more exact to state that the gonopods of the male correspond to the valvular styles of the female insect. The dorsal valvulae of the ovipositor of the female insect are probably modified "coxites" (ovicoxites) corresponding to the "coxites" of the gonopods (gonocoxites) of the male insect, and the gonopods and styli doubtless represent exopodites, while the penis valves and inner valvulae of the ovipositor probably represent endopodites of a pair of limbs whose basal segments are represented by the ovicoxites in the female (dorsal valvulae) or the gonocoxites in the male insect.

It is possible that the penis valves of male ephemerids, sawflies, etc., (i. e., the endopodites of a modified limb) do not strictly correspond to the phallic lobes of male roaches, etc., since the latter may represent merely outgrowths of the intersegmental membrane between the ninth and tenth sternal regions. Furthermore, it is quite possible that the so-called surhami or hook-like processes of the parapodial plates of certain roaches are merely modified processes of the tenth tergite, which have become secondarily united with the parapodial plates. This, and several other points of a similar nature, will be discussed more at length in a later paper.

Mailed April 4th, 1921

